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CLERK OF DISTRICT COURT
SOUTHERN DISTRICT OF CALIFORNIA

BY KNIX DEPUTY

ORIGINAL

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12 PULSE ENGINEERING, INC.

12 UNITED STATES DISTRICT COURT
13
14 FOR THE SOUTHERN DISTRICT OF CALIFORNIA

15 PULSE ENGINEERING, INC., a Delaware
16 corporation,

Case No. '08 CV 0595 JM AJB

17 Plaintiff,

COMPLAINT FOR PATENT
INFRINGEMENT

18 v.

19 MASCON, INC., doing business as ATW
20 SECURITY, a Massachusetts corporation,

DEMAND FOR JURY TRIAL

21 Defendant.

22 Plaintiff Pulse Engineering, Inc. files this Complaint and demand for jury trial seeking relief
23 for patent infringement by the Defendant, stating and alleging the following:

24 THE PARTIES

25 1. Pulse Engineering, Inc. ("Pulse") is a corporation organized and existing under the laws
26 of the State of Delaware with its principal place of business at 12220 World Trade Drive, San Diego,
27 California.

28 2. Mascon, Inc. ("Mascon") is a corporation organized and existing under the laws of the

1 Commonwealth of Massachusetts with its principal place of business at 5 Commonwealth Ave.,
2 Woburn, Massachusetts.

3 3. Pulse is informed and believes, and on that basis alleges, that Mascon is doing business
4 as ATW Security.

5 **JURISDICTION AND VENUE**

6 4. The Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a)
7 because this action arises under the patent laws of the United States, 35 U.S.C. §§ 1 *et seq.* Venue is
8 proper in this Federal District pursuant to 28 U.S.C. §§ 1391(b)-(c) and 1400(b) as Defendant has
9 done business in this District, has committed acts of infringement in this District, and continues to
10 commit acts of infringement in this District, entitling Pulse to relief.

11 **COUNT I**

12 **(Patent Infringement — U.S. Patent No. 6,404,347)**

13 5. On June 11, 2002, United States Patent No. 6,404,347 (“the ‘347 patent”) entitled
14 “Alarm Filter Circuit” was duly and legally issued by the United States Patent and Trademark Office.
15 A true and correct copy of the ‘347 patent is attached hereto and incorporated herein by reference as
16 Exhibit A.

17 6. Plaintiff Pulse is the assignee of the ‘347 patent and holds all rights and interest in the
18 ‘347 patent.

19 7. Upon information and belief, Mascon has been and is infringing, actively inducing
20 others to infringe, and/or contributing to the infringement of the ‘347 patent by making, using, selling,
21 offering for sale and/or importing alarm filters in the United States and this District that are covered
22 by one or more claims of the ‘347 patent, including but not limited to the ATW DSL-500 Alarm DSL
23 Filter.

24 8. As a direct and proximate result of Mascon’s acts of infringement, Pulse has suffered
25 damages and is entitled to recover an amount adequate to compensate for the infringement under
26 35 U.S.C. § 284.

27 9. Upon information and belief, Mascon has knowledge of its infringement of the ‘347
28 patent, yet Mascon continues to infringe the patent. Upon information and belief, the infringement of

1 the '347 patent by Mascon is willful and deliberate, entitling Pulse to increased damages under
2 35 U.S.C. § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C.
3 § 285.

4 10. Mascon has caused, and will continue to cause, irreparable injury and damage to Pulse
5 by infringing the '347 patent. Mascon will continue to cause Pulse irreparable harm, for which there
6 is no adequate remedy at law, unless enjoined by this Court from infringing the '347 patent.

7 **COUNT II**

8 **(Patent Infringement — U.S. Patent No. 6,472,992)**

9 11. On October 29, 2002, United States Patent No. 6,472,992 ("the '992 patent") entitled
10 "Alarm Filter Circuit" was duly and legally issued by the United States Patent and Trademark Office.
11 A true and correct copy of the '992 patent is attached hereto and incorporated herein by reference as
12 Exhibit B.

13 12. Plaintiff Pulse is the assignee of the '992 patent and holds all rights and interest in the
14 '992 patent.

15 13. Upon information and belief, Mascon has been and is infringing, actively inducing
16 others to infringe, and/or contributing to the infringement of the '992 patent by making, using, selling,
17 offering for sale and/or importing alarm filters in the United States and this District that are covered
18 by one or more claims of the '992 patent, including but not limited to the ATW DSL-500 Alarm DSL
19 Filter.

20 14. As a direct and proximate result of Mascon's acts of infringement, Pulse has suffered
21 damages and is entitled to recover an amount adequate to compensate for the infringement under
22 35 U.S.C. § 284.

23 15. Upon information and belief, Mascon has knowledge of its infringement of the '992
24 patent, yet Mascon continues to infringe the patent. Upon information and belief, the infringement of
25 the '992 patent by Mascon is willful and deliberate, entitling Pulse to increased damages under
26 35 U.S.C. § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C.
27 § 285.

28 16. Mascon has caused, and will continue to cause, irreparable injury and damage to Pulse

1 by infringing the '992 patent. Mascon will continue to cause Pulse irreparable harm, for which there
 2 is no adequate remedy at law, unless enjoined by this Court from infringing the '992 patent.

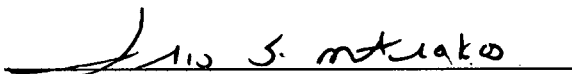
3 **PRAYER FOR RELIEF**

4 WHEREFORE, Plaintiff Pulse requests entry of judgment in its favor and against Defendant
 5 Mascon as to each count as follows:

- 6 (a) Judgment that Mascon has infringed and continues to infringe claims of the '347 and
 7 '992 patents;
- 8 (b) An order permanently enjoining Mascon and its respective officers, agents, employees,
 9 and those acting in privity with them, from further infringement, contributory
 10 infringement and/or inducing infringement of the '347 and '992 patents;
- 11 (c) An award of damages to Pulse arising out of Mascon's infringement of the '347 and
 12 '992 patents, including enhanced damages pursuant to 35 U.S.C. § 284, in an amount
 13 according to proof and no less than a reasonable royalty;
- 14 (d) An order, pursuant to 35 U.S.C. § 285, declaring this case to be "exceptional" and
 15 awarding Pulse its reasonable attorneys' fees in connection with this action;
- 16 (e) An order awarding costs of this action to Pulse;
- 17 (f) An order that Mascon must pay Pulse prejudgment and post-judgment interest on
 18 Pulse's damages, costs, and attorneys' fees; and
- 19 (g) An award to Pulse of such other and further relief as this Court deems just and proper.

20 DATED: April 1, 2008

TOWNSEND AND TOWNSEND AND CREW LLP

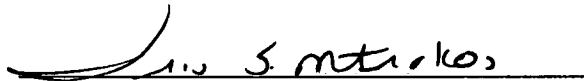
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 23 David E. Sipiora
 24 Iris Sockel Mitrakos
 25 Kristopher L. Reed
 26 Attorneys for Plaintiff
 27 PULSE ENGINEERING, INC.
 28

DEMAND FOR JURY TRIAL

Pursuant to Rule 38 of the Federal Rules of Civil Procedure, Pulse hereby demands a jury trial on all issues so triable.

DATED: April 1, 2008

TOWNSEND AND TOWNSEND AND CREW LLP



David E. Sipiora
Iris Sockel Mitrakos
Kristopher L. Reed
Attorneys for Plaintiff
PULSE ENGINEERING, INC.

NOTICE OF PARTY WITH FINANCIAL INTEREST

Pursuant to Civil Local Rule 40.2, Plaintiff Pulse Engineering, Inc. identifies the following parent companies:

1. Technitrol Delaware, Inc. is the parent company of Plaintiff Pulse Engineering, Inc.
2. Technitrol, Inc. is the parent company of Technitrol Delaware, Inc.

DATED: April 1, 2008

TOWNSEND AND TOWNSEND AND CREW LLP



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Iris Sockel Mitrakos
Kristopher L. Reed
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US006404347B1

(12) **United States Patent**
Kiko

(10) **Patent No.:** **US 6,404,347 B1**
(45) **Date of Patent:** **Jun. 11, 2002**

(54) **ALARM FILTER CIRCUIT**

(75) **Inventor:** **Frederick J. Kiko, Carlsbad, CA (US)**

(73) **Assignee:** **Excelsus Technologies, Inc., Carlsbad, CA (US)**

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) **Appl. No.:** **09/848,654**

(22) **Filed:** **May 4, 2001**

(51) **Int. Cl.:** **G08B 21/00**

(52) **U.S. Cl.:** **340/653; 340/652; 340/310.03; 379/30; 379/90.01; 379/93.08; 379/412**

(58) **Field of Search:** **340/653, 652, 340/286.01, 310.03; 379/37, 38, 39, 40, 47, 49, 45, 51, 93.05, 93.06, 93.07, 93.08, 90.01, 900, 387.01, 390.02, 399, 412; 455/445, 455**

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* cited by examiner

Primary Examiner—Daniel J. Wu

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(74) *Attorney, Agent, or Firm*—Davis Chin

(57) **ABSTRACT**

An alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and alarm unit located at a subscriber's premises so as to block DSL data signals to and from the alarm unit for preventing interference is provided. In one preferred embodiment, the alarm filter circuit includes a first inductor, a second inductor and a third capacitor functioning as a second-order low-pass filter section so as to block the DSL data signals to and from the alarm unit. Second and third capacitors functioning as a first-order high-pass filter section is provided so as to bypass the DSL data signals on the incoming telephone lines to the house wiring. A third inductor and a fourth inductor functioning as a first-order low-pass filter is provided so as to block high-frequency signals between the house wiring and the alarm unit. In a second embodiment, a fourth-order elliptical low-pass filter section replaces the second-order low-pass filter section. In a third embodiment, a third-order high-pass filter section replaces also the first-order high-pass filter section.

19 Claims, 3 Drawing Sheets

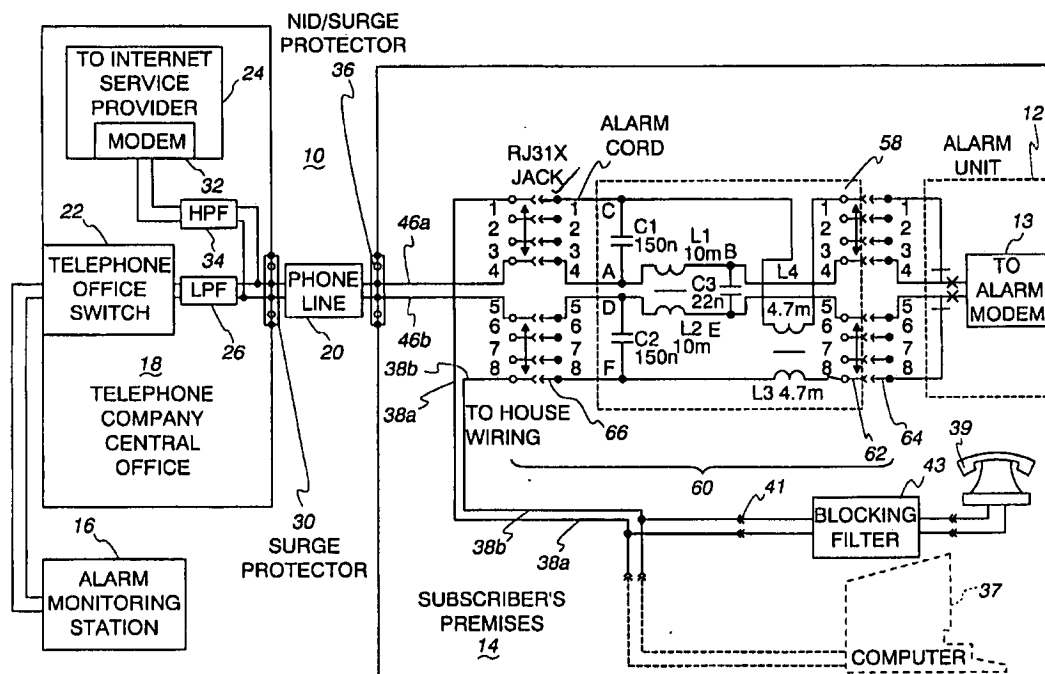


Fig. 1 - Prior art

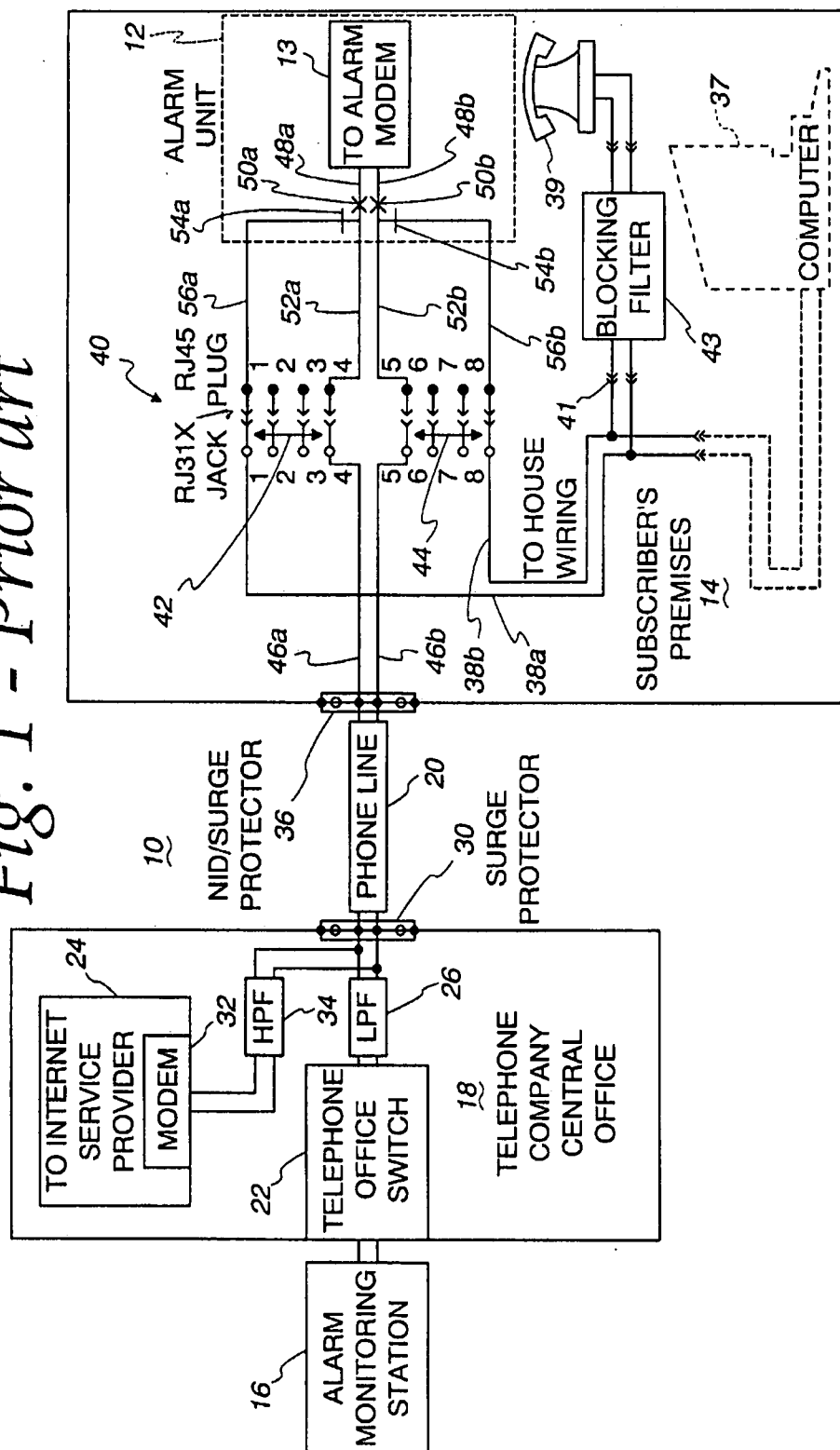
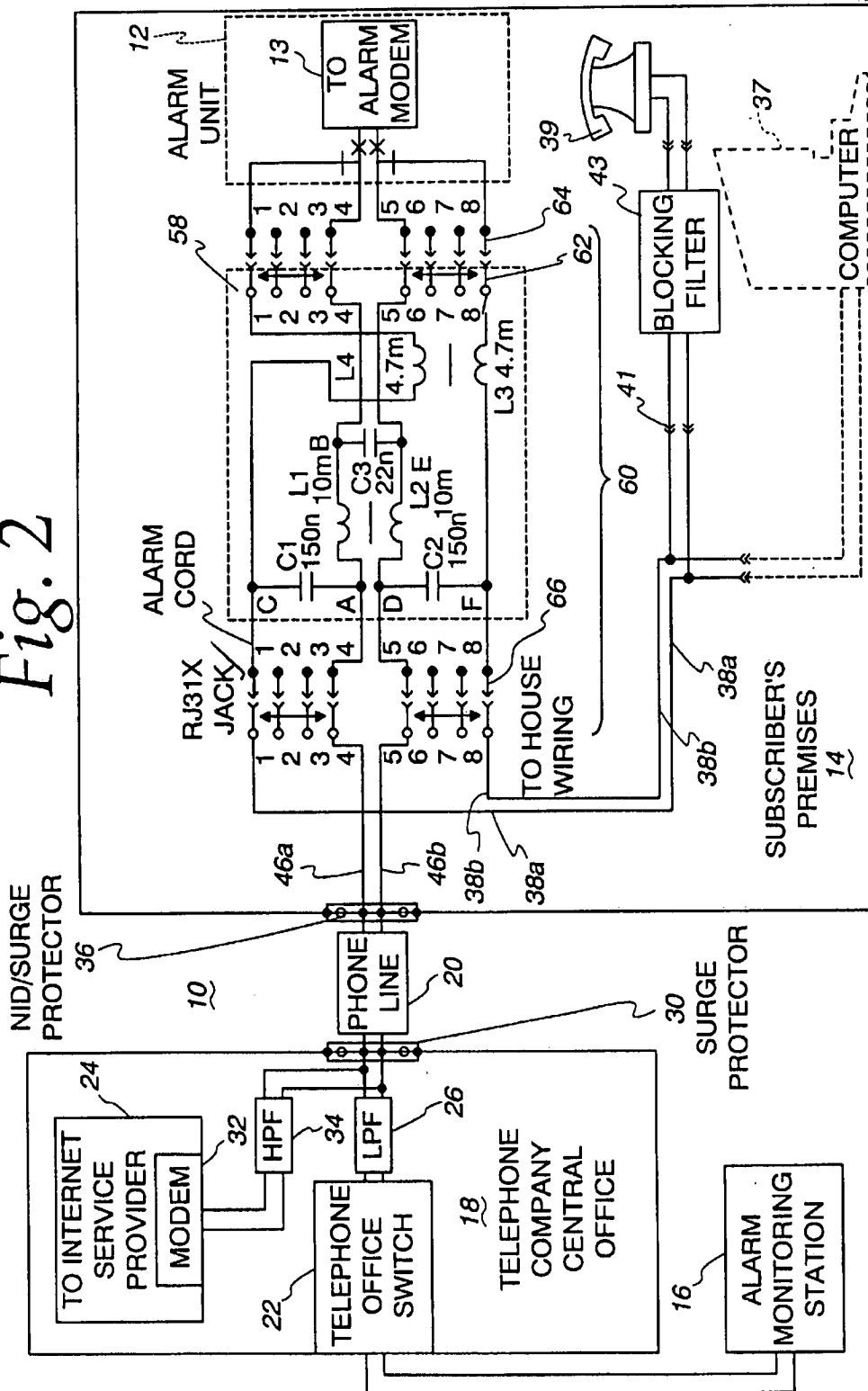


Fig. 2



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Fig. 4

The diagram illustrates a circuit for a DSL bypass and alarm path. It features a multi-line interface with 8 lines on the left and 8 lines on the right. The circuit is divided into several sections:

- DSL BYPASS:** This section is located at the top left and includes capacitors C1, C2, C7, and C8, and inductors L1, L2, and L7. It is connected to lines 1 through 4 on the left and lines 1 through 4 on the right.
- ALARM PATH:** This section is located in the center and includes capacitors C3, C4, C5, and C6, and inductors L3, L4, L5, and L6. It is connected to lines 5 through 8 on the left and lines 5 through 8 on the right.
- HOUSE WIRING TO ALARM FILTERING:** This section is located at the bottom right and includes inductors L3 and L4. It is connected to lines 5 through 8 on the left and lines 5 through 8 on the right.

The circuit is labeled with various components and their values, such as 100n, 1M, 6M8, 4N7, 15N, 4.7m, and 581.

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ALARM FILTER CIRCUIT**BACKGROUND OF THE INVENTION**

This invention relates generally to telecommunication systems and more particularly, it relates to an alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL signals to and from the alarm unit for preventing interference.

It is generally well-known these days that many telephone subscribers or customers also have a personal computer located on their premises. At times, the computer user receives DSL (an acronym for Digital Subscriber Line) signals from the Internet over the same telephone lines via an Internet Service Provider (ISP). In addition, a number of telephone subscribers have an alarm system, such as burglar and/or fire, installed on their premises which is also connected to the same incoming telephone lines via internal house wiring. As a result, during an abnormal or alarm condition when the alarm modem is sending alarm signals to a monitoring station, the DSL signals will cause interference problems with the input circuitry of the alarm modem and will prevent the alarm signals from ever reaching the monitoring station. This problem is due to the input circuitry of the alarm modem not having sufficient low pass filtering above the frequency of 4 KHz since the upstream DSL signals will be at a relatively high level (several volts) beginning at the frequency of 25 KHz or above. Thus, the DSL signals will saturate the input circuitry of the alarm modem. Further, the interference problem will also produce distortion elements which will effectively reduce or limit the DSL data rates.

Accordingly, it would be desirable to provide an alarm filter circuit so as to prevent DSL signals from interfering with an alarm unit located at the subscriber's premises and vice versa. It would be expedient that the alarm filter circuit be capable of a self-installed approach so as to allow the subscriber or customer to perform his own connection, thereby avoiding the time and cost for a trained technician to be sent to a subscriber's premises to perform the installation. The alarm filter circuit of the present invention is of a modular type adapter designed so as to facilitate quick and easy connections between the incoming telephone lines and the alarm unit. The alarm filter circuit serves to block the DSL signals in the frequency band of 25 KHz to 1.1 MHz from reaching the alarm unit.

SUMMARY OF THE INVENTION

Accordingly, it is a general object of the present invention to provide an alarm filter circuit which effectively and efficiently prevents DSL signals from interfering with an alarm unit located at a subscriber's premises.

It is an object of the present invention to provide an alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises.

It is another object of the present invention to provide an alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL signals from interfering with the alarm unit and vice versa.

It is still another object of the present invention to provide an alarm filter circuit which is of a modular type adapter designed so as to facilitate quick and easy connections between incoming telephone lines and an alarm unit.

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It is still yet another object of the present invention to provide an alarm filter circuit which includes a low-pass filter section interconnected between incoming telephone lines and an alarm unit for preventing overloading of the alarm unit and a high-pass filter section for bypassing DSL data signals from the incoming telephone lines to the house wiring and around the low-pass filter section.

It is yet still another object of the present invention to provide an alarm filter circuit which includes a second-order or fourth-order elliptical low pass filter section and a first-order or third-order high-pass filter section.

In accordance with one preferred embodiment of the present invention, there is provided an alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL data signals to and from the alarm unit for preventing interference. The alarm filter circuit includes a second-order low-pass filter section formed of a first inductor, a second inductor, and a first capacitor; a first-order high-pass filter section formed of a second capacitor and a third capacitor; and a first-order low-pass filter section formed of a third inductor and a fourth inductor.

In a second embodiment of the present invention, the alarm filter circuit includes a fourth-order elliptical low-pass filter section formed of first through fourth inductors and first through fourth capacitors; a first-order high-pass filter section formed of a fifth capacitor and a sixth capacitor; and a first-order low-pass filter section formed of a fifth inductor and a sixth inductor. In a third embodiment of the present invention, the alarm filter circuit includes a fourth-order elliptical low-pass filter section formed of first through fourth inductors and first through fourth capacitors; a third-order high-pass filter section formed of a fifth through eighth capacitors and a fifth inductor; and a first-order low-pass filter section formed of a sixth inductor and a seventh inductor.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of the present invention will become more fully apparent from the following detailed description when read in conjunction with the accompanying drawings with like reference numerals indicating corresponding parts throughout, wherein:

FIG. 1 is a simplified block diagram of a conventional telecommunication system for interconnecting an alarm unit located at a subscriber's premises to a monitoring station connected to a central office of a telephone company;

FIG. 2 is a detailed schematic circuit diagram of an alarm filter circuit of the present invention housed in a modular type adapter for interconnection between the incoming telephone lines and the alarm unit in FIG. 1, constructed in accordance with the principles of the present invention;

FIG. 3 is schematic circuit diagram of a second embodiment of an alarm filter circuit in accordance with the present invention; and

FIG. 4 is schematic circuit diagram of a third embodiment of an alarm filter circuit in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in detail to the drawings, there is illustrated in FIG. 1 a simplified block diagram of a conventional telecommunication system 10 for interconnecting between

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an alarm unit 12 located at a subscriber's or customer's premises 14 and an alarm monitoring station 16 connected to a telephone company's central office 18 via a transmission media such as a conventional twisted pair of telephone lines 20. The central office 18 includes a telephone office switch 22 and an Internet Service Provider (ISP) 24. The telephone office switch 22 is used to send voice signals via low-pass filter 26 and a surge protector 30 to the telephone lines 20. The ISP 24 transmits DSL data signals to a modem 32 which are then sent to the telephone lines 20 via a high-pass filter 34 and the surge protector 30.

It should be noted that the voice signals from the telephone office switch 22 and the DSL data signals from the ISP 24 can be transmitted simultaneously to the telephone lines 20. Further, the voice signals (speech) are in the frequency band between 300 Hz and 3400 Hz, and the DSL data signals are in the frequency band between 25 KHz and 2 MHz.

The subscriber's premises 14 includes a Network Interface Device (NID)/surge protector unit 36 which is connected to the incoming telephone lines 20 on its input side and is connected to the subscriber's internal wiring or house wiring 38a, 38b on its output side for a normal alarm installation via a special FCC specified connector 40. The connector 40 is a RJ31X jack and RJ45 plug unit which is installed between the NID/surge protector unit 36 and the house wiring 38a, 38b. The connector 40 allows the incoming telephone lines 20 to be disconnected from the house wiring 38a, 38b and to be connected directly instead to the alarm unit 12 so that the alarm modem 13 thereof can dial up the alarm monitoring station 16.

As can be seen, when there is no alarm unit 12 connected at the subscriber's premises the RJ45 plug of the connector 40 is disconnected from the RJ31X jack. As a result, the bridging or shorting bar 42 will cause terminal pins 1 and 4 to be shorted together, and the bridging bar 44 will cause terminal pins 5 and 8 to be shorted together. Thus, the line wire 46a (coming from the NID) connected also to the terminal pin 4 will be joined to the house wiring 38a connected also to the terminal pin 1. Similarly, the line wire 46b (coming from the NID) connected also to the terminal pin 5 will be joined to the house wiring 38b connected also to the terminal pin 8.

On the other hand, when the alarm unit 12 connected to the RJ45 plug is plugged into the RJ31X jack the bridging bars 42, 44 will cause the terminal pins 1, 4 and 5, 8 to become disconnected respectively, thereby allowing both the line wire 46a, 46b and the house wiring 38a, 38b to be connected directly to the alarm unit 12.

The alarm unit 12 includes the alarm modem 13 having leads 48a, 48b connected to one side of a pair of normally-open relay contacts 50a, 50b respectively. The other side of the normally-open contacts 50a, 50b are joined to the respective RJ45 plug terminal pins 4, 5 via lines 52a, 52b. Further, the other side of the normally-open relay contact 50a is also joined to one side of a normally-closed relay contact 54a, and the other side of the normally-open relay contact 50b is also connected to one side of a normally-closed relay contact 54b. The other side of the normally-closed contact 54a is joined to the RJ45 plug terminal pin 1 via line 56a, and the other side of the normally-closed contact 54b is joined to the RJ45 plug terminal pin 8 via line 56b.

In normal operation, the alarm unit 12 will be in an idle state and all of the relay contacts 50a, 50b, and 54a, 54b will be in the positions as shown. In this normal condition, the line wire 46a will be joined to the house wiring 38a via line

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52a, normally-closed contact 54a, line 56a and pin 1 of the connector 40. Likewise, the line wire 46b will be joined to the house wiring 38b via line 52b, normally-closed contact 54b, line 56b and pin 8 of the connector 40. This is identical to the connection when no alarm unit 12 is plugged into the RJ31X jack of the connector 40.

In an abnormal situation (an alarm condition), the alarm unit 12 will be activated so as to cause the normally-open contacts 48a, 48b to close and the normally-closed contacts 54a, 54b to open. As a consequence, the line wires 46a, 46b will be disconnected from the house wiring 38a, 38b and will be connected directly instead to the alarm modem 13 which can then dial up the alarm monitoring station 16.

Unfortunately, when a personal computer 37 connected to the house wiring 38a, 38b is downloading information from the ISP 24, the DSL data signals are being transmitted over the same line wires 46a, 46b which will cause interference problems (overload and/or distortion) with the alarm modem 13 of the alarm unit 12 attempting to call the alarm monitoring station 16. Further, a plurality of telephone sets 39 (one of which is shown) are also connected to the same house wiring 38a, 38b via a RJ-11 unit 41 and an impedance blocking filter 43 for preventing DSL interference problems caused by the telephone terminal equipment (i.e., the telephone sets 39). In view of this, the inventor of the present invention has developed an alarm filter circuit 58 which can be interconnected between the connector 40 and the alarm unit 12 so as to block the DSL data signals from the ISP 24 from being received by the input circuitry of the alarm modem 13 in order to prevent interference problems. Moreover, in order to facilitate self-installation by a telephone subscriber or customer without having a trained technician visit the premises and perform the installation, the alarm filter circuit 58 is arranged in a modular type adapter design.

In FIG. 2, there is shown a detailed schematic circuit diagram of the alarm filter circuit 58 housed in a modular type adapter 60 for interconnection between the incoming telephone line wires 46a, 46b and the alarm unit 12. One end of the modular type adapter 60 has a RJ31X jack 62 formed integrally therewith for connection to the alarm unit 12. This connection is achieved by plugging a RJ-45 plug 64 from the alarm unit 12 into the jack 62. The other end of the modular type adapter 60 has a RJ-45 plug 66 formed integrally therewith which is connectible to both the incoming telephone line wiring 46a, 46b and the house wiring 38a, 38b. In particular, the RJ-45 plug 66 is connected to the incoming line wiring and the house wiring by plugging the same into the RJ31X jack of the connector 40.

The alarm filter circuit 58 is connected to input tip and ring terminal pins 4, 5 (inner pair) of the RJ-45 plug 66 which are joined to the incoming line wires 46a, 46b via the RJ31X jack of the connector 40. The alarm filter circuit is also connected to the input tip and ring terminal pins 1, 8 (outer pair) of the RJ-45 plug 66 which are joined to the house wiring 38a, 38b via the same RJ31X jack. The alarm filter circuit is further connected to the output tip and ring terminal pins 4, 5 of the RJ31X jack 62 which are connected to the alarm modem 13 of the alarm unit 12 via the RJ-45 plug 64. The alarm filter circuit is further connected to the output tip and ring pins 1, 8 of the RJ31X jack 62 which are connected to the house wiring 38a, 38b via the same plug 64. The alarm filter circuit is comprised of inductors L1 through L4 and capacitors C1 through C3.

One end of the inductor L1 is connected to the input tip terminal pin 4 and to one end of the capacitor C1 at a node

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A. The other end of the inductor L1 is connected to the output tip terminal pin 4 and to one end of the capacitor C3 at node B. The other end of the capacitor C1 is connected to the terminal pin 1 and to one end of the inductor L4 at a node C. The other end of the inductor L4 is connected to the output tip terminal pin 1.

Similarly, one end of the inductor L2 is connected to the input ring terminal pin 5 and to one end of the capacitor C2 at a node D. The other end of the inductor L2 is connected to the output ring terminal pin 5 and to the other end of the capacitor C3 at node E. The other end of the capacitor C2 is connected to the pin 8 and to one end of the inductor L3 at node F. The other end of the inductor L3 is connected to the output ring terminal pin 8.

The inductors L1 and L2 have the same inductance value, and the inductors L3 and L4 have the same inductance values. Each of the inductors is preferably formed by a separate winding so as to avoid longitudinal impedance problems due to RF interferences (i.e., AM broadcast or Ham radio transmission). However, it should be understood by those skilled in the art that the individual inductors L1, L2 (L3, L4) could be replaced by a dual winding inductor.

The inductors L1, L2 and the capacitor C3 is basically a second-order low-pass filter section which blocks the DSL data signals being in the frequency band of 25 KHz-1.1 MHz to and from the input circuitry of the alarm modem 13, thereby preventing any interference problems during an alarm condition. These DSL data signals are sent or bypassed to the house wiring 38a, 38b connected to the personal computer 37 by way of the respective capacitors C1, C2 defining a first-order high-pass filter section. Further, the inductors L3, L4 form a first-order low-pass filter section which serves to filter high frequency signals generated between the house wiring 38a, 38b and the alarm modem 13. The values of the inductors and capacitors are selected so as to provide the desired flatness in the frequency bands of the alarm modem (400 Hz to 4 KHz) and the ADSL signals (25 KHz to 1.1 MHz) for both the idle state and the alarm condition.

For completeness in disclosure of the above-identified alarm filter circuit but not for purposes of limitation, the following representative values and component identifications are submitted. These values and components were employed in an alarm filter circuit that was constructed and tested, and which provides high quality performance.

PART	TYPE OR VALUE
L1, L2	10 mH
L3, L4	4.7 mH
C1, C2	150 nF
C3	22 nF

From the foregoing detailed description, it can thus be seen that the present invention provides an alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL data signals to and from the alarm unit for preventing interference. In one preferred embodiment, the alarm filter circuit includes a first inductor, a second inductor and a third capacitor functioning as a second-order low-pass filter section so as to block the DSL data signals to and from the alarm unit. Second and third capacitors functioning as a first-order high-pass filter section is provided so as to bypass

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the DSL data signals on the incoming telephone lines to the house wiring. A third inductor and a fourth inductor functioning as a first-order low-pass filter is provided so as to block high-frequency signals between the house wiring and the alarm unit.

While the alarm filter circuit 58 of FIG. 2 performed adequately, the inventor has found based upon testing of certain alarm signals that a higher attenuation at frequencies above 25 KHz was required for the second-order low-pass filter section (L1, L2, C3). Thus, there is shown in FIG. 3 a schematic circuit diagram of a second embodiment of an alarm filter circuit 58a of the present invention having a fourth-order elliptical low-pass filter section. The alarm filter circuit 58a having the fourth-order elliptical low-pass filter section of FIG. 3 is substantially identical to the alarm filter circuit 58 having the second-order low-pass filter section of FIG. 2, except there has been added inductors L5, L6 and capacitors C4-C6.

Specifically, the inductor L6 and the capacitor C4 connected in parallel are joined between the node B and the output tip terminal pin 4. The inductor L5 and the capacitor C5 connected in parallel are joined between the node E and the output ring terminal pin 5. The capacitor C6 has its one end connected also to the terminal pin 4 and its other end connected also to the terminal pin 5. During the alarm condition, the fourth-order elliptical low-pass filter section will block the DSL data signals to and from the input circuitry of the alarm modem. Further, in the idle state the fourth-order elliptical low-pass filter section will be connected in series with the first-order low-pass filter section (L3, L4) so as to effectively bypass signals in the DC to 4 KHz range to and from the incoming lines and the house wiring.

In order to provide a flatter response in the frequency range of 25 KHz to 100 KHz for both the idle state and the alarm condition than the first-order high-pass filter section (C1, C2) of FIG. 3, the inventor has developed a third-order high-pass filter section for bypassing the DSL data signals above 25 KHz to and from the alarm modem. Therefore, there is shown in FIG. 4 a schematic circuit diagram of a third embodiment of an alarm filter circuit 58b of the present invention having a third-order high-pass filter section. The alarm filter circuit 58b having the third-order high-pass filter section of FIG. 4 is substantially identical to the alarm filter circuit 58a of FIG. 3, except there has been added an inductor L7 and capacitors C7, C8.

In particular, the capacitor C7 has its one end connected to one end of the capacitor C1 at a node G and its other end connected to the node A. The capacitor C8 has its one end connected to one end of the capacitor C2 at a node H and its other end connected to the node D. One end of the inductor L7 is also connected to the node G, and the other end of the inductor L7 is connected also to the node H.

While there has been illustrated and described what is at present considered to be a preferred embodiment of the present invention, it will be understood by those skilled in the art that various changes and modifications may be made, and equivalents may be substituted for elements thereof without departing from the true scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the central scope thereof. Therefore, it is intended that this invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out the invention, but that the invention will include all embodiments falling within the scope of the appended claims.

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What is claimed is:

1. An alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL data signals to and from the alarm unit for preventing interference, said alarm filter circuit comprising:

a second-order low-pass filter section formed of a first inductor, a second inductor, and a first capacitor;

the first inductor having a first end and a second end;

the second inductor having a first end and a second end;

the first capacitor having a first end connected to said first end of said first inductor and to a first output terminal pin and having a second end connected to said first end of said second inductor and to a second output terminal pin;

a first-order high-pass filter section formed of second capacitor and a third capacitor;

the second capacitor having a first end connected to said second end of said first inductor and to a first input terminal pin and having a second end connected to a second input terminal pin;

the third capacitor having its first end connected to said second end of said second inductor and to a third input terminal pin and having its second end connected to a fourth output terminal pin;

a first-order low-pass filter section formed of third inductor and a fourth inductor;

the third inductor having a first end connected also to said second end of said second capacitor and having a second end connected to a third output terminal pin; and

the fourth inductor having a first end connected also to said second end of said third capacitor and having a second end connected to a fourth output terminal pin.

2. An alarm filter circuit as claimed in claim 1, wherein said first inductor, second inductor and first capacitor function as the second-order low-pass filter section so as to block the DSL data signals to and from said alarm unit.

3. An alarm filter circuit as claimed in claim 2, wherein said first and second inductors have values on the order of 10 mH.

4. An alarm filter circuit as claimed in claim 3, wherein said third capacitor has a value on the order of 22 nF.

5. An alarm filter circuit as claimed in claim 4, wherein said third and fourth inductors function as the first-order low-pass filter section so as to block high-frequency signals to and from house wiring and said alarm unit.

6. An alarm filter circuit as claimed in claim 5, wherein said third and fourth inductors have values on the order of 4.7 mH.

7. An alarm filter circuit as claimed in claim 6, wherein said second and third capacitors function as the first-order high-pass filter section so as to bypass the DSL signals on the incoming telephone lines to the house wiring.

8. An alarm filter circuit as claimed in claim 7, wherein said second and third capacitors have values on the order of 150 nF.

9. An alarm filter circuit as claimed in claim 1, wherein said first through fourth inductors and first through third capacitors are housed in a modular type adaptor design having plug means on its one end for connection to the incoming telephone lines and having jack means on its other end for connection to said alarm unit.

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10. An alarm filter circuit as claimed in claim 9, wherein said plug means is a RJ-45 plug.

11. An alarm filter circuit as claimed in claim 10 wherein said jack means is a RJ31X jack.

12. An alarm filter circuit as claimed in claim 11, wherein said adaptor design is capable of self-installation by a subscriber or customer.

13. An alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL data signals to and from the alarm unit for preventing interference, said alarm filter circuit comprising:

a fourth-order elliptical low-pass filter section formed of first through fourth inductors and first through fourth capacitors;

the first inductor having a first end and a second end;

the second inductor having a first end and a second end;

the first capacitor having a first end connected to said first end of said first inductor and having a second end connected to said first end of said second inductor;

said third inductor and said second capacitor being connected in parallel and having its one end joined also to said first end of said first inductor and its other end joined to one end of said third capacitor and a first output terminal pin;

said fourth inductor and fourth capacitor being connected in parallel and having its one end joined also to said first end of said second inductor and its other end joined to the other end of said fourth capacitor and a second output terminal pin;

a first-order high-pass filter section formed of fifth capacitor and a sixth capacitor;

the fifth capacitor having a first end connected to said second end of said first inductor and to a first input terminal pin and having a second end connected to a second input terminal pin;

the sixth capacitor having its first end connected to said second end of said second inductor and to a third input terminal pin and having its second end connected to a fourth output terminal pin;

a first-order low-pass filter section formed of fifth inductor and a sixth inductor;

the fifth inductor having a first end connected also to said second end of said fifth capacitor and having a second end connected to a third output terminal pin; and

the sixth inductor having a first end connected also to said second end of said sixth capacitor and having a second end connected to a fourth output terminal pin.

14. An alarm filter circuit as claimed in claim 13, wherein said first through fourth inductors and first through fourth capacitors function as the fourth-order elliptical low-pass filter section so as to block the DSL data signals to and from said alarm unit with a flatter response for frequencies between 25 KHz-100 KHz.

15. An alarm filter circuit as claimed in claim 13, further comprising a seventh capacitor interconnected between the first end of said fifth capacitor and said first input terminal pin, an eighth capacitor interconnected between the first end of said sixth capacitor and said second input terminal pin, and a seventh inductor having its one end connected also to

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the first end of said fifth capacitor and having its other end connected also to the first end of said sixth capacitor so as to define a third-order high-pass filter section.

16. An alarm filter circuit as claimed in claim 13, wherein said first through sixth inductors and first through sixth capacitors are housed in a modular type adaptor design having plug means on its one end for connection to the incoming telephone lines and having jack means on its other end for connection to said alarm unit.

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17. An alarm filter circuit as claimed in claim 16, wherein said plug means is a RJ-45 plug.

18. An alarm filter circuit as claimed in claim 17, wherein said jack means is a RJ31X jack.

19. An alarm filter circuit as claimed in claim 18, wherein said adapter design is capable of self-installation by a subscriber or customer.

* * * * *



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Kiko

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(45) **Date of Patent:** ***Oct. 29, 2002**

(54) **ALARM FILTER CIRCUIT**

(75) **Inventor:** **Frederick J. Kiko, Carlsbad, CA (US)**

(73) **Assignee:** **Excelsus Technologies, Inc., Carlsbad, CA (US)**

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) **Appl. No.:** **10/013,218**

(22) **Filed:** **Dec. 12, 2001**

Related U.S. Application Data

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(51) **Int. Cl.⁷** **G08B 21/00**

(52) **U.S. Cl.** **340/653; 340/310.03; 340/652; 379/30; 379/90.01; 379/93.08; 379/412**

(58) **Field of Search** **340/653, 652, 340/286.01, 310.03; 379/37, 38, 39, 40, 47, 49, 45, 51, 93.05, 93.06, 93.07, 93.08, 90.01, 900, 387.01, 390.02, 399, 412; 455/495, 455**

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Primary Examiner—Daniel J. Wu

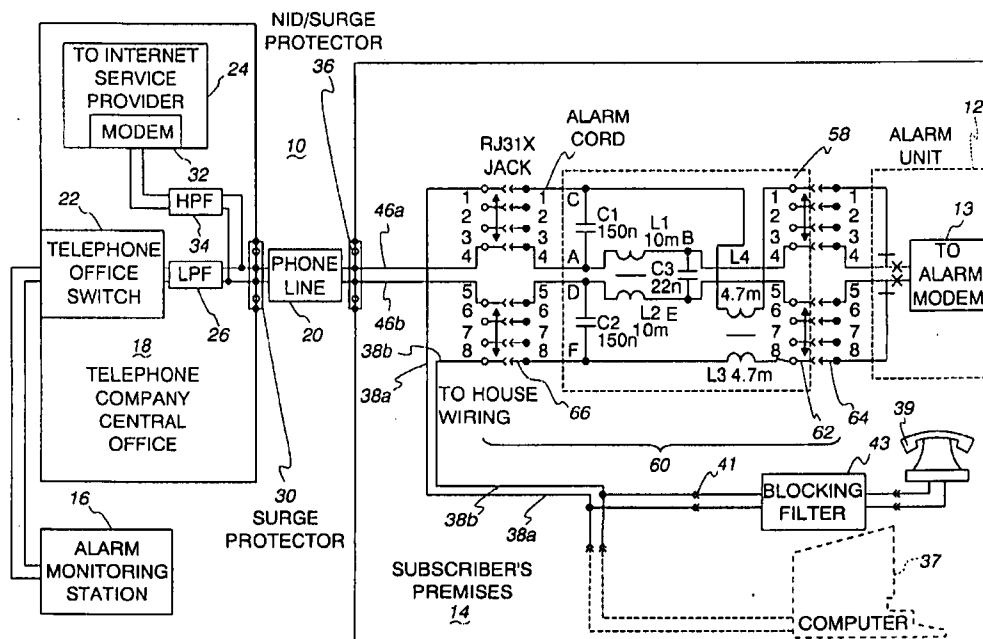
Assistant Examiner—Davetta W. Goins

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(57) **ABSTRACT**

An alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and alarm unit located at a subscriber's premises so as to block DSL data signals to and from the alarm unit for preventing interference is provided. In one preferred embodiment, the alarm filter circuit includes a second-order low-pass filter section for blocking the DSL data signals to and from the alarm unit, a first-order high-pass filter section for bypassing the DSL data signals on the incoming telephone lines to the house wiring, and a first-order low-pass filter section for blocking high-frequency signals between the house wiring and the alarm unit. In a second embodiment, a fourth-order elliptical low-pass filter section replaces the second-order low-pass filter section. In a third embodiment, a third-order high-pass filter section replaces also the first-order high-pass filter section. In fourth through sixth embodiments, the first-order low-pass filter section is replaced by a second-order low-pass filter section. Further, the fourth through sixth embodiments includes surge protection circuitry for protecting the alarm unit from being damaged by transients.

20 Claims, 6 Drawing Sheets



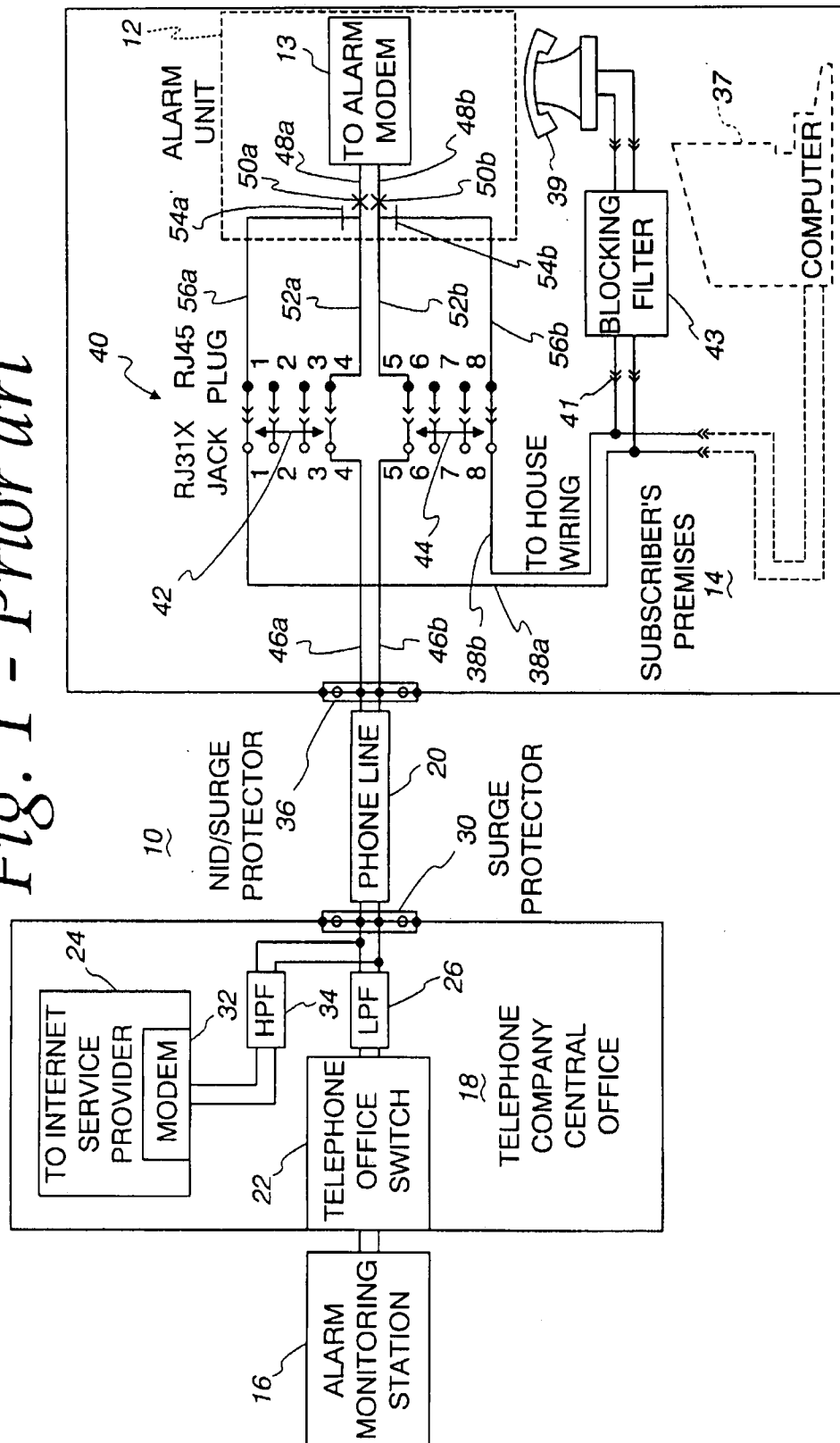
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Fig. 1 - Prior art



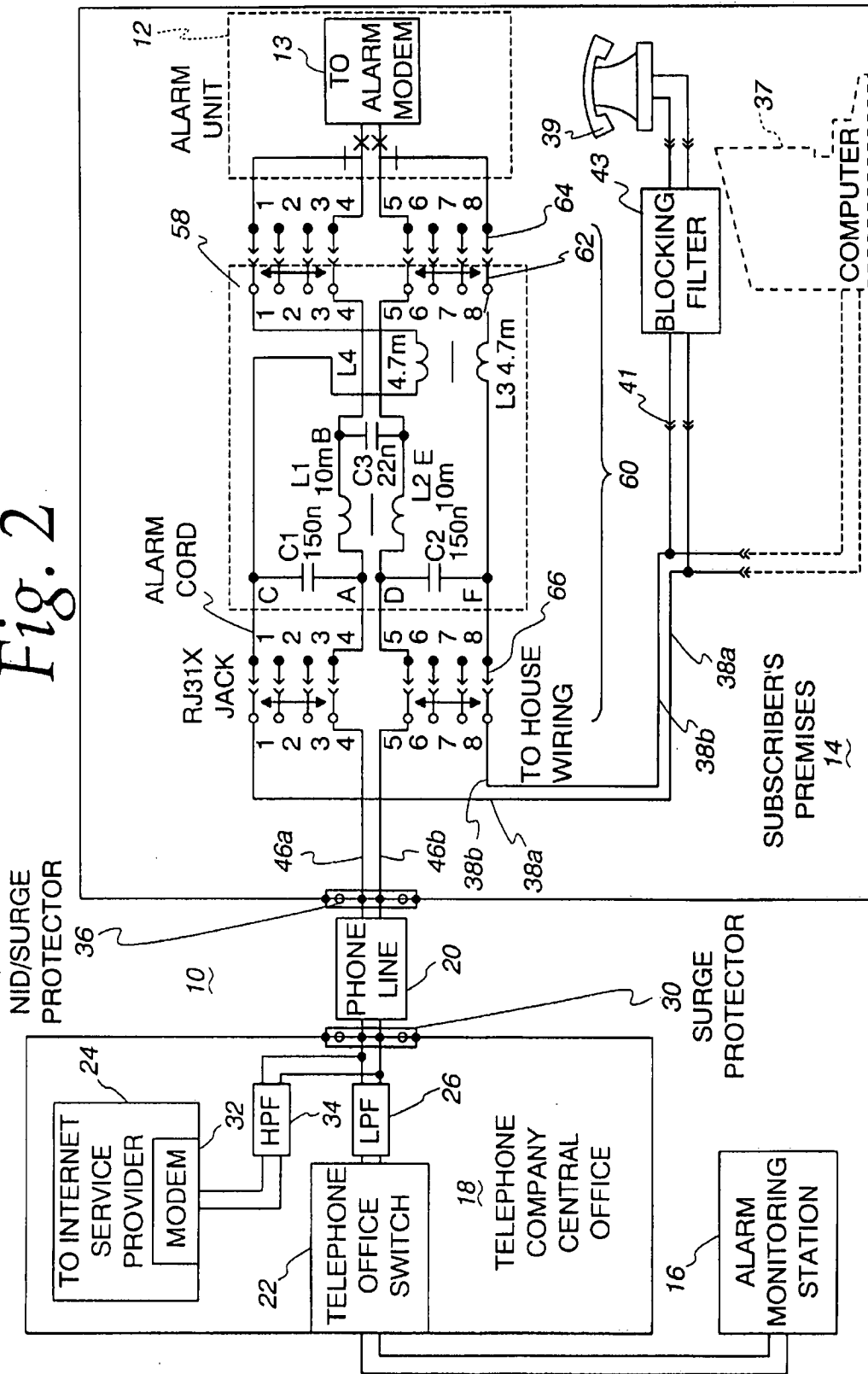
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Fig. 2

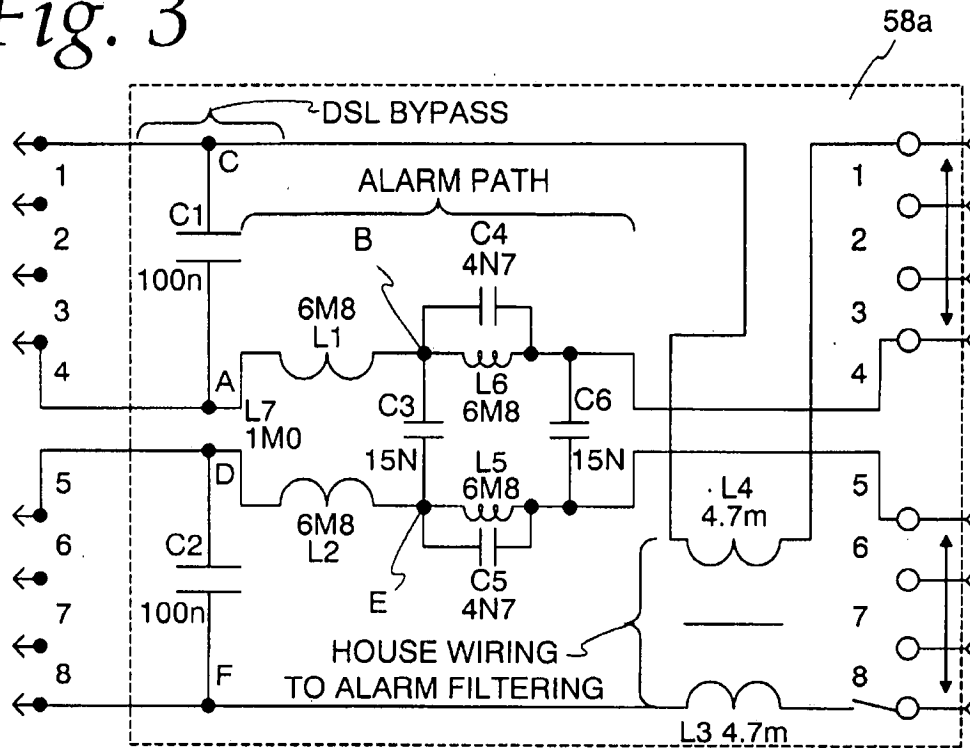
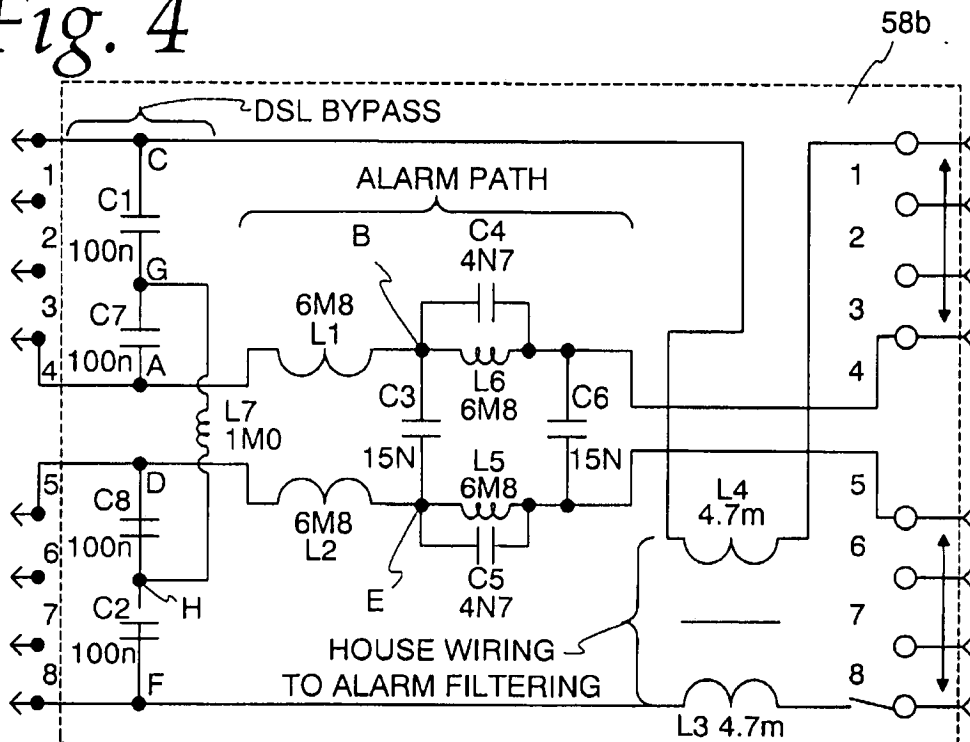


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Fig. 3*Fig. 4*

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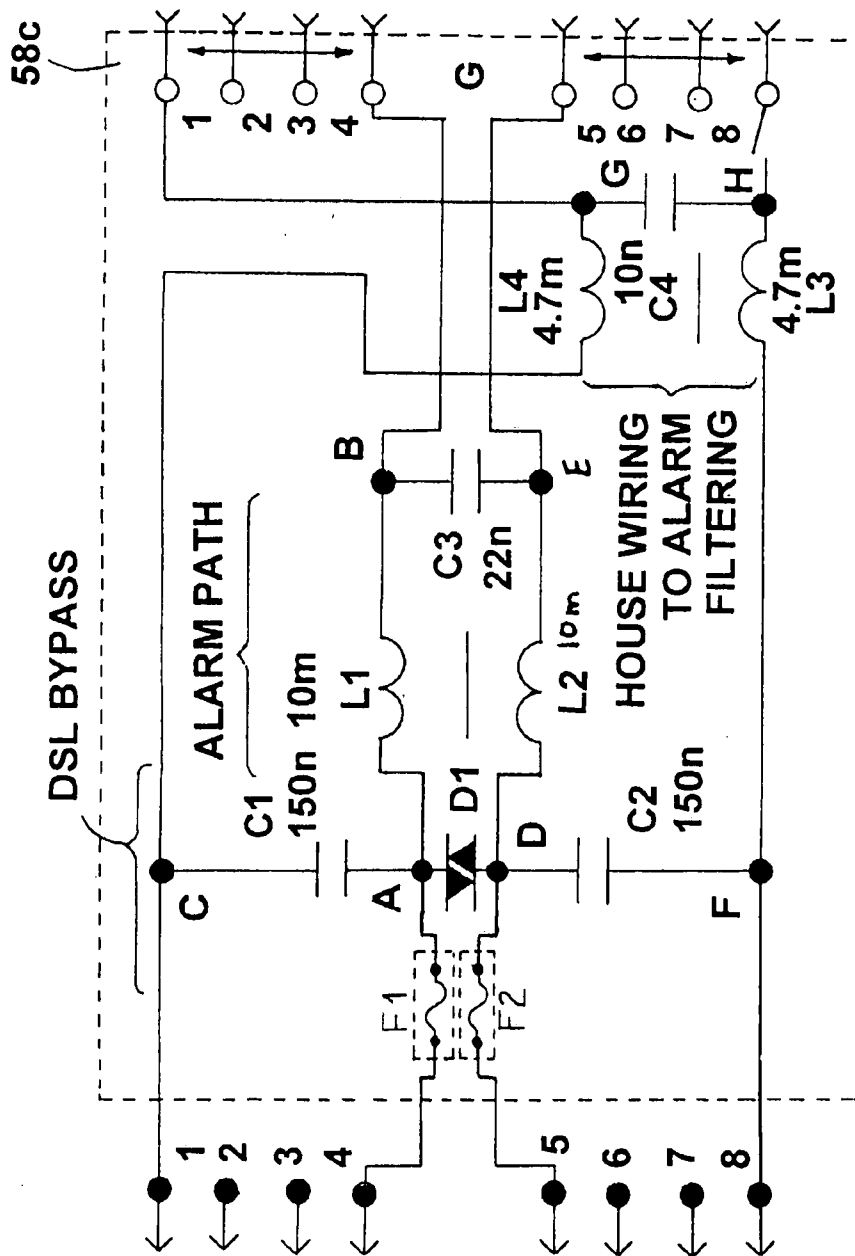


Fig. 5

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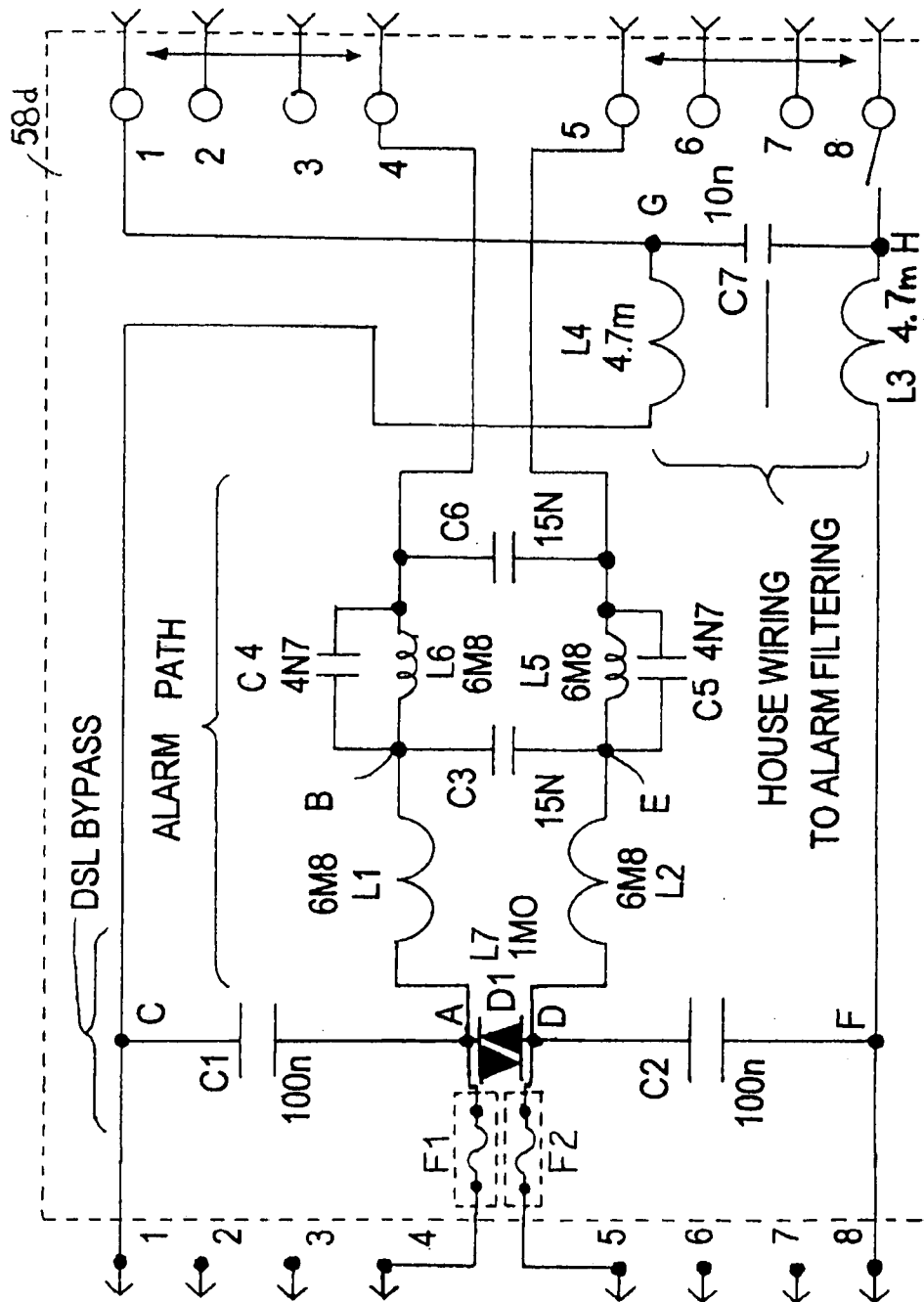


Fig. 6

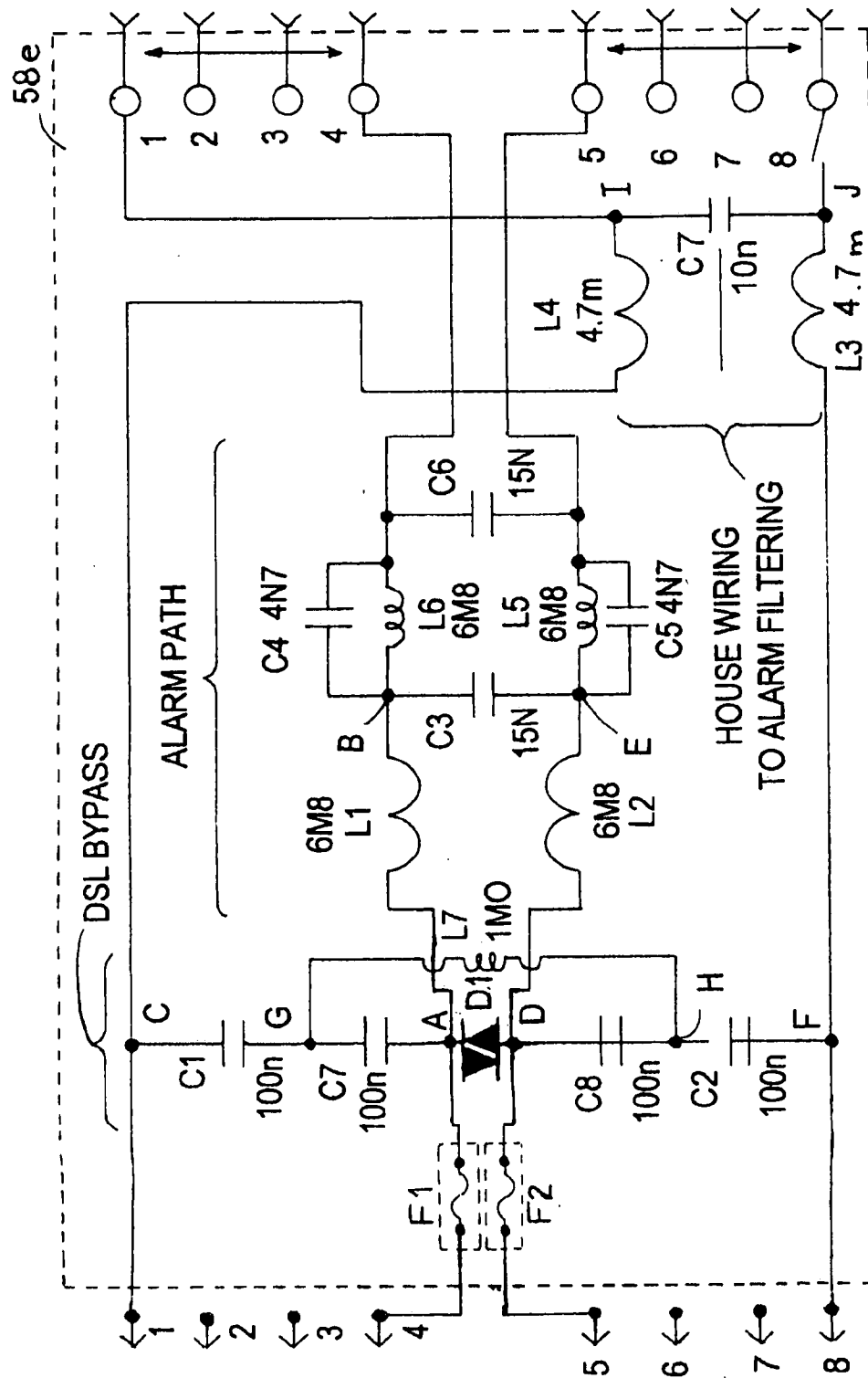


Fig. 7

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ALARM FILTER CIRCUIT**CROSS REFERENCE TO RELATED APPLICATIONS**

The present invention is a continuation-in-part application based on parent application Ser. No. 09/848,654 filed on May 4, 2001 and entitled "Alarm Filter Circuit which is now U.S. Pat. No. 6,404,347 B1 patent Jun. 11, 2002."

BACKGROUND OF THE INVENTION

This invention relates generally to telecommunication systems and more particularly, it relates to an alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL signals to and from the alarm unit for preventing interference.

It is generally well-known these days that many telephone subscribers or customers also have a personal computer located on their premises. At times, the computer user receives DSL (an acronym for Digital Subscriber Line) signals from the Internet over the same telephone lines via an Internet Service Provider (ISP). In addition, a number of telephone subscribers have an alarm system, such as burglar and/or fire, installed on their premises which is also connected to the same incoming telephone lines via internal house wiring. As a result, during an abnormal or alarm condition when the alarm modem is sending alarm signals to a monitoring station, the DSL signals will cause interference problems with the input circuitry of the alarm modem and will prevent the alarm signals from ever reaching the monitoring station. This problem is due to the input circuitry of the alarm modem not having sufficient low pass filtering above the frequency of 4 KHz since the upstream DSL signals will be at a relatively high level (several volts) beginning at the frequency of 25 KHz or above. Thus, the DSL signals will saturate the input circuitry of the alarm modem. Further, the interference problem will also produce distortion elements which will effectively reduce or limit the DSL data rates.

Accordingly, it would be desirable to provide an alarm filter circuit so as to prevent DSL signals from interfering with an alarm unit located at the subscriber's premises and vice versa. It would be expedient that the alarm filter circuit be capable of a self-installed approach so as to allow the subscriber or customer to perform his own connection, thereby avoiding the time and cost for a trained technician to be sent to a subscriber's premises to perform the installation. The alarm filter circuit of the present invention is of a modular type adapter designed so as to facilitate quick and easy connections between the incoming telephone lines and the alarm unit. The alarm filter circuit serves to block the DSL signals in the frequency band of 25 KHz to 1.1 MHz from reaching the alarm unit.

SUMMARY OF THE INVENTION

Accordingly, it is a general object of the present invention to provide an alarm filter circuit which effectively and efficiently prevents DSL signals from interfering with an alarm unit located at a subscriber's premises.

It is an object of the present invention to provide an alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises.

It is another object of the present invention to provide an alarm filter circuit used in telecommunication systems for

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interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL signals from interfering with the alarm unit and vice versa.

It is still another object of the present invention to provide an alarm filter circuit which is of a modular type adapter designed so as to facilitate quick and easy connections between incoming telephone lines and an alarm unit.

It is still yet another object of the present invention to provide an alarm filter circuit which includes a low-pass filter section interconnected between incoming telephone lines and an alarm unit for preventing overloading of the alarm unit and a high-pass filter section for bypassing DSL data signals from the incoming telephone lines to the house wiring and around the low-pass filter section.

It is yet still another object of the present invention to provide an alarm filter circuit which includes a second-order or fourth-order elliptical low pass filter section and a first-order or third-order high-pass filter section.

In accordance with one preferred embodiment of the present invention, there is provided an alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL data signals to and from the alarm unit for preventing interference. The alarm filter circuit includes a second-order low-pass filter section formed of a first inductor, a second inductor, and a first capacitor; a first-order high-pass filter section formed of a second capacitor and a third capacitor; and a first-order low-pass filter section formed of a third inductor and a fourth inductor.

In a second embodiment of the present invention, the alarm filter circuit includes a fourth-order elliptical low-pass filter section formed of first through fourth inductors and first through fourth capacitors; a first-order high-pass filter section formed of a fifth capacitor and a sixth capacitor; and a first-order low-pass filter section formed of a fifth inductor and a sixth inductor. In a third embodiment of the present invention, the alarm filter circuit includes a fourth-order elliptical low-pass filter section formed of first through fourth inductors and first through fourth capacitors; a third-order high-pass filter section formed of a fifth through eighth capacitors and a fifth inductor; and a first-order low-pass filter section formed of a sixth inductor and a seventh inductor.

The foregoing applies specifically to the disclosure of the parent application Ser. No. 09/848,654. A fourth embodiment of an alarm filter circuit of the present invention added by way of this continuation-in-part application is quite similar to FIG. 2, except that the filter circuit thereof has been modified so as to include a capacitor C4 connected across the inductor L3 and L4. As a result, this fourth embodiment represents an improvement over the embodiment of FIG. 2 since it provides additional attenuation of the DSL signals so as to eliminate interference problems. In addition, there is provided optionally a sidactor or metal-oxide varistor D1, or other surge device such as a gas tube, connected across the incoming telephone lines. Further, slow-blow fuses F1, F2 may be optionally connected in series with the respective incoming telephone lines. The varistor D1 and the fuses F1, F2 function as surge protection means for preventing damage to the alarm filter circuit due to a power cross-over on the telephone lines.

In addition, a fifth embodiment of an alarm filter circuit of the present invention also added by way of this continuation-in-part application includes all of the components of the

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second embodiment of FIG. 3 and has further added a capacitor C7 connected across the inductors L3 and L4. Also, a sidactor or metal-oxide varistor D1 and slow-blow fuses F1, F2, which are identical to the ones added in the fourth embodiment, have also been included and function in the same manner.

In a sixth embodiment, there is provided an alarm filter circuit which includes all of the components of the third embodiment of FIG. 4 and has further added a capacitor C7 connected along the inductors L3 and L4. Also, a metal-oxide varistor D1 and slow-blow fuses F1, F2, which are identical to the ones added in the fourth and fifth embodiments, have also been included and function in the same manner.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of the present invention will become more fully apparent from the following detailed description when read in conjunction with the accompanying drawings with like reference numerals indicating corresponding parts throughout, wherein:

FIG. 1 is a simplified block diagram of a conventional telecommunication system for interconnecting an alarm unit located at a subscriber's premises to a monitoring station connected to a central office of a telephone company;

FIG. 2 is a detailed schematic circuit diagram of an alarm filter circuit of the present invention housed in a modular type adapter for interconnection between the incoming telephone lines and the alarm unit in FIG. 1, constructed in accordance with the principles of the present invention;

FIG. 3 is schematic circuit diagram of a second embodiment of an alarm filter circuit in accordance with the present invention;

FIG. 4 is schematic circuit diagram of a third embodiment of an alarm filter circuit in accordance with the present invention;

FIG. 5 is schematic circuit diagram of a fourth embodiment of an alarm filter circuit in accordance with the present invention;

FIG. 6 is schematic circuit diagram of a fifth embodiment of an alarm filter circuit in accordance with the present invention; and

FIG. 7 is schematic circuit diagram of a sixth embodiment of an alarm filter circuit in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in detail to the drawings, there is illustrated in FIG. 1 a simplified block diagram of a conventional telecommunication system 10 for interconnecting between an alarm unit 12 located at a subscriber's or customer's premises 14 and an alarm monitoring station 16 connected to a telephone company's central office 18 via a transmission media such as a conventional twisted pair of telephone lines 20. The central office 18 includes a telephone office switch 22 and an Internet Service Provider (ISP) 24. The telephone office switch 22 is used to send voice signals via low-pass filter 26 and a surge protector 30 to the telephone lines 20. The ISP 24 transmits DSL data signals to a modem 32 which are then sent to the telephone lines 20 via a high-pass filter 34 and the surge protector 30.

It should be noted that the voice signals from the telephone office switch 22 and the DSL data signals from the ISP 24 can be transmitted simultaneously to the telephone lines

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20. Further, the voice signals (speech) are in the frequency band between 300 Hz and 3400 Hz, and the DSL data signals are in the frequency band between 25 KHz and 2 MHz.

The subscriber's premises 14 includes a Network Interface Device (NID)/surge protector unit 36 which is connected to the incoming telephone lines 20 on its input side and is connected to the subscriber's internal wiring or house wiring 38a, 38b on its output side for a normal alarm installation via a special FCC specified connector 40. The connector 40 is a RJ31X jack and RJ45 plug unit which is installed between the NID/surge protector unit 36 and the house wiring 38a, 38b. The connector 40 allows the incoming telephone lines 20 to be disconnected from the house wiring 38a, 38b and to be connected directly instead to the alarm unit 12 so that the alarm modem 13 thereof can dial up the alarm monitoring station 16.

As can be seen, when there is no alarm unit 12 connected at the subscriber's premises the RJ45 plug of the connector 40 is disconnected from the RJ31X jack. As a result, the bridging or shorting bar 42 will cause terminal pins 1 and 4 to be shorted together, and the bridging bar 44 will cause terminal pins 5 and 8 to be shorted together. Thus, the line wire 46a (coming from the NID) connected also to the terminal pin 4 will be joined to the house wiring 38a connected also to the terminal pin 1. Similarly, the line wire 46b (coming from the NID) connected also to the terminal pin 5 will be joined to the house wiring 38b connected also to the terminal pin 8.

On the other hand, when the alarm unit 12 connected to the RJ45 plug is plugged into the RJ31X jack the bridging bars 42, 44 will cause the terminal pins 1, 4 and 5, 8 to become disconnected respectively, thereby allowing both the line wire 46a, 46b and the house wiring 38a, 38b to be connected directly to the alarm unit 12.

The alarm unit 12 includes the alarm modem 13 having leads 48a, 48b connected to one side of a pair of normally-open relay contacts 50a, 50b respectively. The other side of the normally-open contacts 50a, 50b are joined to the respective RJ45 plug terminal pins 4, 5 via lines 52a, 52b. Further, the other side of the normally-open relay contact 50a is also joined to one side of a normally-closed relay contact 54a, and the other side of the normally-open relay contact 50b is also connected to one side of a normally-closed relay contact 54b. The other side of the normally-closed contact 54a is joined to the RJ45 plug terminal pin 1 via line 56a, and the other side of the normally-closed contact 54b is joined to the RJ45 plug terminal pin 8 via line 56b.

In normal operation, the alarm unit 12 will be in an idle state and all of the relay contacts 50a, 50b, and 54a, 54b will be in the positions as shown. In this normal condition, the line wire 46a will be joined to the house wiring 38a via line 52a, normally-closed contact 54a, line 56a and pin 1 of the connector 40. Likewise, the line wire 46b will be joined to the house wiring 38b via line 52b, normally-closed contact 54b, line 56b and pin 8 of the connector 40. This is identical to the connection when no alarm unit 12 is plugged into the RJ31X jack of the connector 40.

In an abnormal situation (an alarm condition), the alarm unit 12 will be activated so as to cause the normally-open contacts 48a, 48b to close and the normally-closed contacts 54a, 54b to open. As a consequence, the line wires 46a, 46b will be disconnected from the house wiring 38a, 38b and will be connected directly instead to the alarm modem 13 which can then dial up the alarm monitoring station 16.

Unfortunately, when a personal computer 37 connected to the house wiring 38a, 38b is downloading information from

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the ISP 24, the DSL data signals are being transmitted over the same line wires 46a, 46b which will cause interference problems (overload and/or distortion) with the alarm modem 13 of the alarm unit 12 attempting to call the alarm monitoring station 16. Further, a plurality of telephone sets 39 (one of which is shown) are also connected to the same house wiring 38a, 38b via a RJ-11 unit 41 and an impedance blocking filter 43 for preventing DSL interference problems caused by the telephone terminal equipment (i.e., the telephone sets 39). In view of this, the inventor of the present invention has developed an alarm filter circuit 58 which can be interconnected between the connector 40 and the alarm unit 12 so as to block the DSL data signals from the ISP 24 from being received by the input circuitry of the alarm modem 13 in order to prevent interference problems. Moreover, in order to facilitate self-installation by a telephone subscriber or customer without having a trained technician visit the premises and perform the installation, the alarm filter circuit 58 is arranged in a modular type adapter design.

In FIG. 2, there is shown a detailed schematic circuit diagram of the alarm filter circuit 58 housed in a modular type adapter 60 for interconnection between the incoming telephone line wires 46a, 46b and the alarm unit 12. One end of the modular type adapter 60 has a RJ31X jack 62 formed integrally therewith for connection to the alarm unit 12. This connection is achieved by plugging a RJ-45 plug 64 from the alarm unit 12 into the jack 62. The other end of the modular type adapter 60 has a RJ-45 plug 66 formed integrally therewith which is connectible to both the incoming telephone line wiring 46a, 46b and the house wiring 38a, 38b. In particular, the RJ-45 plug 66 is connected to the incoming line wiring and the house wiring by plugging the same into the RJ31X jack of the connector 40.

The alarm filter circuit 58 is connected to input tip and ring terminal pins 4, 5 (inner pair) of the RJ-45 plug 66 which are joined to the incoming line wires 46a, 46b via the RJ31X jack of the connector 40. The alarm filter circuit is also connected to the input tip and ring terminal pins 1, 8 (outer pair) of the RJ-45 plug 66 which are joined to the house wiring 38a, 38b via the same RJ31X jack. The alarm filter circuit is further connected to the output tip and ring terminal pins 4, 5 of the RJ31X jack 62 which are connected to the alarm modem 13 of the alarm unit 12 via the RJ-45 plug 64. The alarm filter circuit is further connected to the output tip and ring pins 1, 8 of the RJ31X jack 62 which are connected to the house wiring 38a, 38b via the same plug 64. The alarm filter circuit is comprised of inductors L1 through L4 and capacitors C1 through C3.

One end of the inductor L1 is connected to the input tip terminal pin 4 and to one end of the capacitor C1 at a node A. The other end of the inductor L1 is connected to the output tip terminal pin 4 and to one end of the capacitor C3 at node B. The other end of the capacitor C1 is connected to the terminal pin 1 and to one end of the inductor L4 at a node C. The other end of the inductor L4 is connected to the output tip terminal pin 1.

Similarly, one end of the inductor L2 is connected to the input ring terminal pin 5 and to one end of the capacitor C2 at a node D. The other end of the inductor L2 is connected to the output ring terminal pin 5 and to the other end of the capacitor C3 at node E. The other end of the capacitor C2 is connected to the pin 8 and to one end of the inductor L3 at node F. The other end of the inductor L3 is connected to the output ring terminal pin 8.

The inductors L1 and L2 have the same inductance value, and the inductors L3 and L4 have the same inductance

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values. Each of the inductors is preferably formed by a separate winding so as to avoid longitudinal impedance problems due to RF interferences (i.e., AM broadcast or Ham radio transmission). However, it should be understood by those skilled in the art that the individual inductors L1, L2 (L3, L4) could be replaced by a dual winding inductor.

The inductors L1, L2 and the capacitor C3 is basically a second-order low-pass filter section which blocks the DSL data signals being in the frequency band of 25 KHz–1.1 MHz to and from the input circuitry of the alarm modem 13, thereby preventing any interference problems during an alarm condition. These DSL data signals are sent or bypassed to the house wiring 38a, 38b connected to the personal computer 37 by way of the respective capacitors C1, C2 defining a first-order high-pass filter section. Further, the inductors L3, L4 form a first-order low-pass filter section which serves to filter high frequency signals generated between the house wiring 38a, 38b and the alarm modem 13. The values of the inductors and capacitors are selected so as to provide the desired flatness in the frequency bands of the alarm modem (400 Hz to 4 KHz) and the DSL signals (25 KHz to 1.1 MHz) for both the idle state and the alarm condition.

For completeness in disclosure of the above-identified alarm filter circuit but not for purposes of limitation, the following representative values and component identifications are submitted. These values and components were employed in an alarm filter circuit that was constructed and tested, and which provides high quality performance.

PART	TYPE OR VALUE
L1, L2	10 mH
L3, L4	4.7 mH
C1, C2	150 nF
C3	22 nF

From the foregoing detailed description, it can thus be seen that the present invention provides an alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL data signals to and from the alarm unit for preventing interference. In one preferred embodiment, the alarm filter circuit includes a first inductor, a second inductor and a third capacitor functioning as a second-order low-pass filter section so as to block the DSL data signals to and from the alarm unit. Second and third capacitors functioning as a first-order high-pass filter section is provided so as to bypass the DSL data signals on the incoming telephone lines to the house wiring. A third inductor and a fourth inductor functioning as a first-order low-pass filter is provided so as to block high-frequency signals between the house wiring and the alarm unit.

While the alarm filter circuit 58 of FIG. 2 performed adequately, the inventor has found based upon testing of certain alarm signals that a higher attenuation at frequencies above 25 KHz was required for the second-order low-pass filter section (L1, L2, C3). Thus, there is shown in FIG. 3 a schematic circuit diagram of a second embodiment of an alarm filter circuit 58a of the present invention having a fourth-order elliptical low-pass filter section. The alarm filter circuit 58a having the fourth-order elliptical low-pass filter section of FIG. 3 is substantially identical to the alarm filter circuit 58 having the second-order low-pass filter section of FIG. 2, except there has been added inductors L5, L6 and capacitors C4–6.

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Specifically, the inductor L6 and the capacitor C4 connected in parallel are joined between the node B and the output tip terminal pin 4. The inductor L5 and the capacitor C5 connected in parallel are joined between the node E and the output ring terminal pin 5. The capacitor C6 has its one end connected also to the terminal pin 4 and its other end connected also to the terminal pin 5. During the alarm condition, the fourth-order elliptical low-pass filter section will block the DSL data signals to and from the input circuitry of the alarm modem. Further, in the idle state the fourth-order elliptical low-pass filter section will be connected in series with the first-order low-pass filter section (L3, L4) so as to effectively bypass signals in the DC to 4 KHz range to and from the incoming lines and the house wiring.

In order to provide a flatter response in the frequency range of 25 KHz to 100 KHz for both the idle state and the alarm condition than the first-order high-pass filter section (C1, C2) of FIG. 3, the inventor has developed a third-order high-pass filter section for bypassing the DSL data signals above 25 KHz to and from the alarm modem. Therefore, there is shown in FIG. 4 a schematic circuit diagram of a third embodiment of an alarm filter circuit 58b of the present invention having a third-order high-pass filter section. The alarm filter circuit 58b having the third-order high-pass filter section of FIG. 4 is substantially identical to the alarm filter circuit 58a of FIG. 3, except there has been added an inductor L7 and capacitors C7, C8.

In particular, the capacitor C7 has its one end connected to one end of the capacitor C1 at a node G and its other end connected to the node A. The capacitor C8 has its one end connected to one end of the capacitor C2 at a node H and its other end connected to the node D. One end of the inductor L7 is also connected to the node G, and the other end of the inductor L7 is connected also to the node H.

While the first-order low-pass filter section of the alarm filter circuit 58 at FIG. 2 performs adequately for filtering the high frequency signals between the house wiring and the alarm unit for most alarm systems, the inventor has found that based upon additional testing there is required higher attenuation for some alarm systems in the frequency bands of the alarm modem (400 Hz to 4 KHz) and the DSL signals (25 KHz to 1.1 MHz) for both the idle state and the alarm condition. In order to provide such attenuation for better operation of the alarm modem, a capacitor C4 has been added so as to convert the first-order low-pass filter section into a second-order low-pass section which is illustrated in a fourth embodiment of the present invention in FIG. 5.

In particular, the fourth embodiment of an alarm filter circuit 58c includes all of the circuit elements used in the filter circuit of FIG. 2 and further includes a capacitor C4 having its one end connected to the inductor L4 at a node G and its other end connected to the inductor L3 at a node H. In addition, in view of the fact that some customers desire surge protection there is provided optionally a sidactor or metal-oxide varistor D1, or other surge device such as a gas tube, connected between the nodes A and D for connection across the incoming telephone lines. Further, a first slow-blow fuse F1 is connected in series with incoming telephone line 46a, and a second slow-blow fuse F2 is connected in series with the incoming telephone line 46b. The sidactor or varistor D1 and the slow-blow fuses F1, F2 defining surge protection means serves to protect the alarm unit from being damaged or destroyed due to transients occurring on the incoming telephone lines.

In FIG. 6, there is illustrated a fifth embodiment of an alarm filter circuit 58d of the present invention. The fifth

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embodiment includes all of the circuit elements used in the filter circuit of FIG. 3 and further includes a capacitor C7 having its one end connected to the inductor L4 at a node G and its other end connected to the inductor L3 at a node H. In addition, there is provided optionally a sidactor or metal-oxide varistor D1, or other surge device such as a gas tube, connected between the nodes A and D for connection across the incoming telephone lines. Further, a first slow-blow fuse F1 is connected in series with incoming telephone line 46a, and a second slow-blow fuse F2 is connected in series with the incoming telephone line 46b.

In FIG. 7, there is depicted a sixth embodiment of an alarm filter circuit 58e of the present invention. The sixth embodiment includes all of the circuit elements used in the filter circuit of FIG. 4 and further includes a capacitor C7 having its one end connected to the inductor L4 at a node I and its other end connected to the inductor L3 at a node J. In addition, there is provided optionally a sidactor or metal-oxide varistor D1, or other surge device such as a gas tube, connected between the nodes A and D for connection across the incoming telephone lines. Further, a first slow-blow fuse F1 is connected in series with incoming telephone line 46a, and a second slow-blow fuse F2 is connected in series with the incoming telephone line 46b.

While there has been illustrated and described what is at present considered to be a preferred embodiment of the present invention, it will be understood by those skilled in the art that various changes and modifications may be made, and equivalents may be substituted for elements thereof without departing from the true scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the central scope thereof. Therefore, it is intended that this invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out the invention, but that the invention will include all embodiments falling within the scope of the appended claims.

What is claimed is:

1. An alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL data signals to and from the alarm unit for preventing interference, said alarm filter circuit comprising:
 - a second-order low-pass filter section formed of a first inductor, a second inductor, and a first capacitor;
 - the first inductor having a first end and a second end;
 - the second inductor having a first end and a second end;
 - the first capacitor having a first end connected to said first end of said first inductor and to a first output terminal pin and having a second end connected to said first end of said second inductor and to a second output terminal pin;
 - a first-order high-pass filter section formed of second capacitor and a third capacitor;
 - the second capacitor having a first end connected to said second end of said first inductor and to a first input terminal pin and having a second end connected to a second input terminal pin;
 - the third capacitor having its first end connected to said second end of said second inductor and to a third input terminal pin and having its second end connected to a fourth input terminal pin;
 - a second-order low-pass filter section formed of third inductor, a fourth inductor and a fourth capacitor;

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the third inductor having a first end connected also to said second end of said second capacitor and having a second end connected to one end of the fourth capacitor and a third output terminal pin; and

the fourth inductor having a first end connected also to said second end of said third capacitor and having a second end connected to the other end of the fourth capacitor and a fourth output terminal pin.

2. An alarm filter circuit as claimed in claim 1, wherein said third inductor, fourth inductor and fourth capacitor function as the second-order low-pass filter section so as to block high-frequency signals to and from house wiring and said alarm unit.

3. An alarm filter circuit as claimed in claim 2, wherein said third and fourth inductors have values on the order of 4.7 mH.

4. An alarm filter circuit as claimed in claim 3, wherein said fourth capacitor has a value on the order of 10 nF.

5. An alarm filter circuit as claimed in claim 1, wherein said first through fourth inductors and first through fourth capacitors are housed in a modular type adaptor design having plug means on its one end for connection to the incoming telephone lines and having jack means on its other end for connection to said alarm unit.

6. An alarm filter circuit as claimed in claim 5, wherein said plug means is a RJ-45 plug.

7. An alarm filter circuit as claimed in claim 6, wherein said jack means is a RJ31X/RJ38X jack.

8. An alarm filter circuit as claimed in claim 7, wherein said adapter design is capable of self-installation by a subscriber or customer.

9. An alarm filter circuit as claimed in claim 1, further comprising surge protection means interconnected between the incoming telephone lines and said alarm unit for protecting said alarm unit from being damaged by transients occurring on the incoming telephone lines.

10. An alarm filter circuit as claimed in claim 9, wherein said surge protection means includes a sidactor or metal-oxide varistor connected across the incoming telephone lines and a slow-blow fuse connected in series with each of the incoming telephone lines.

11. An alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL data signals to and from the alarm unit for preventing interference, said alarm filter circuit comprising:

a fourth-order elliptical low-pass filter section formed of first through fourth inductors and first through fourth capacitors;

the first inductor having a first end and a second end;

the second inductor having a first end and a second end;

the first capacitor having a first end connected to said first end of said first inductor and having a second end connected to said first end of said second inductor;

said third inductor and said second capacitor being connected in parallel and having its one end joined also to said first end of said first inductor and its other end joined to one end of said third capacitor and a first output terminal pin;

said fourth inductor and fourth capacitor being connected in parallel and having its one end joined also to said first end of said second inductor and its other end joined to the other end of said fourth capacitor and a second output terminal pin;

a first-order high-pass filter section formed of fifth capacitor and a sixth capacitor;

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the fifth capacitor having a first end connected to said second end of said first inductor and to a first input terminal pin and having a second end connected to a second input terminal pin;

the sixth capacitor having its first end connected to said second end of said second inductor and to a third input terminal pin and having its second end connected to a fourth input terminal pin;

a second-order low-pass filter section formed of fifth inductor, a sixth inductor and a seventh capacitor;

the fifth inductor having a first end connected also to said second end of said fifth capacitor and having a second end connected to one end of the seventh capacitor and a third output terminal pin; and

the sixth inductor having a first end connected also to said second end of said sixth capacitor and having a second end connected to the other end of the seventh capacitor and a fourth output terminal pin.

12. An alarm filter circuit as claimed in claim 11, wherein said third inductor, fourth inductor and seventh capacitor function as the second-order low-pass filter section so as to block high-frequency signals to and from house wiring and said alarm unit.

13. An alarm filter circuit as claimed in claim 12, wherein said third and fourth inductors have values on the order of 4.7 mH.

14. An alarm filter circuit as claimed in claim 13, wherein said seventh capacitor has a value on the order of 10 nF.

15. An alarm filter circuit as claimed in claim 11, further comprising surge protection means interconnected between the incoming telephone lines and said alarm unit for protecting said alarm unit from being damaged by transients occurring on the incoming telephone lines.

16. An alarm filter circuit as claimed in claim 15, wherein said surge protection means includes a sidactor or metal-oxide varistor connected across the incoming telephone lines and a slow-blow fuse connected in series with each of the incoming telephone lines.

17. An alarm filter circuit used in telecommunication systems for interconnecting between incoming telephone lines and an alarm unit located at a subscriber's premises so as to block DSL data signals to and from the alarm unit for preventing interference, said alarm filter circuit comprising:

a fourth-order elliptical low-pass filter section formed of first through fourth inductors and first through fourth capacitors;

the first inductor having a first end and a second end;

the second inductor having a first end and a second end;

the first capacitor having a first end connected to said first end of said first inductor and having a second end connected to said first end of said second inductor;

said third inductor and said second capacitor being connected in parallel and having its one end joined also to said first end of said first inductor and its other end joined to one end of said third capacitor and a first output terminal pin;

said fourth inductor and fourth capacitor being connected in parallel and having its one end joined also to said first end of said second inductor and its other end joined to the other end of said fourth capacitor and a second output terminal pin;

a third-order high-pass filter section formed of fifth through eighth capacitors and a fifth inductor;

the fifth capacitor having a first end connected to a first input terminal pin and having a second end connected

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to a first end of said sixth capacitor and to a first end of said fifth inductor;
 a second end of said sixth capacitor being connected to a second input terminal pin;
 the seventh capacitor having its first end connected to a third input terminal pin and having its second end connected to a first end of said eighth capacitor and to a second end of said fifth inductor;
 a second end of said eighth capacitor being connected to a fourth input terminal pin;
 a second-order low-pass filter section formed of sixth inductor, a seventh inductor and a ninth capacitor;
 the sixth inductor having a first end connected also to said second end of said fifth capacitor and having a second end connected to one end of said ninth capacitor and a third output terminal pin; and
 the seventh inductor having a first end connected also to said second end of said sixth capacitor and having a

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second end connected to the other end of said ninth capacitor and a fourth output terminal pin.

18. An alarm filter circuit as claimed in claim 17, wherein said sixth inductor, seventh inductor and ninth capacitor function as the second-order low-pass filter section so as to block high-frequency signals to and from house wiring and said alarm unit.

19. An alarm filter circuit as claimed in claim 17, further comprising surge protection means interconnected between the incoming telephone lines and said alarm unit for protecting said alarm unit from being damaged by transients occurring on the incoming telephone lines.

20. An alarm filter circuit as claimed in claim 19, wherein said surge protection means includes a sidactor or metal-oxide varistor connected across the incoming telephone lines and a slow-blow fuse connected in series with each of the incoming telephone lines.

* * * * *

JS 44 (Rev. 12/07)

CIVIL COVER SHEET

ORIGINAL

The JS 44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE REVERSE OF THE FORM.)

I. (a) PLAINTIFFS

PULSE ENGINEERING, INC., a Delaware corporation

DEFENDANTS

MASCON, INC. doing business as ATW SECURITY, a
Massachusetts corporation

(b) County of Residence of First Listed Plaintiff San Diego
(EXCEPT IN U.S. PLAINTIFF CASES)

County of Residence of First Listed Defendant Middlesex/Massachusetts
(IN U.S. PLAINTIFF CASES ONLY)

NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE
LAND INVOLVED.

Attorneys (If Known)

BY EMT DEPUTY

08 CV 0595 JM AJB

(c) Attorney's (Firm Name, Address, and Telephone Number)

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1200 Seventeenth Street, Suite 2700
Denver, CO 80202
Attorneys for Plaintiff

II. BASIS OF JURISDICTION (Place an "X" in One Box Only)

- ☐ 1 U.S. Government Plaintiff
☐ 2 U.S. Government Defendant
☒ 3 Federal Question (U.S. Government Not a Party)
☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES (Place an "X" in One Box for Plaintiff and One Box for Defendant)

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| Citizen of This State | <input type="checkbox"/> 1 | <input type="checkbox"/> 1 | Incorporated or Principal Place of Business In This State | <input type="checkbox"/> 4 | <input type="checkbox"/> 4 |
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| Citizen or Subject of a Foreign Country | <input type="checkbox"/> 3 | <input type="checkbox"/> 3 | Foreign Nation | <input type="checkbox"/> 6 | <input type="checkbox"/> 6 |

IV. NATURE OF SUIT (Place an "X" in One Box Only)

CONTRACT	TORTS		FORFEITURE/PENALTY	BANKRUPTCY	OTHER STATUTES
<input type="checkbox"/> 110 Insurance <input type="checkbox"/> 120 Marine <input type="checkbox"/> 130 Miller Act <input type="checkbox"/> 140 Negotiable Instrument <input type="checkbox"/> 150 Recovery of Overpayment & Enforcement of Judgment <input type="checkbox"/> 151 Medicare Act <input type="checkbox"/> 152 Recovery of Defaulted Student Loans (Excl. Veterans) <input type="checkbox"/> 153 Recovery of Overpayment of Veteran's Benefits <input type="checkbox"/> 160 Stockholders' Suits <input type="checkbox"/> 190 Other Contract <input type="checkbox"/> 195 Contract Product Liability <input type="checkbox"/> 196 Franchise	PERSONAL INJURY <input type="checkbox"/> 310 Airplane <input type="checkbox"/> 315 Airplane Product Liability <input type="checkbox"/> 320 Assault, Libel & Slander <input type="checkbox"/> 330 Federal Employers' Liability <input type="checkbox"/> 340 Marine <input type="checkbox"/> 345 Marine Product Liability <input type="checkbox"/> 350 Motor Vehicle <input type="checkbox"/> 355 Motor Vehicle Product Liability <input type="checkbox"/> 360 Other Personal Injury	PERSONAL INJURY <input type="checkbox"/> 362 Personal Injury—Med. Malpractice <input type="checkbox"/> 365 Personal Injury—Product Liability <input type="checkbox"/> 368 Asbestos Personal Injury Product Liability PERSONAL PROPERTY <input type="checkbox"/> 370 Other Fraud <input type="checkbox"/> 371 Truth in Lending <input type="checkbox"/> 380 Other Personal Property Damage <input type="checkbox"/> 385 Property Damage Product Liability	<input type="checkbox"/> 610 Agriculture <input type="checkbox"/> 620 Other Food & Drug <input type="checkbox"/> 625 Drug Related Seizure of Property 21 USC 881 <input type="checkbox"/> 630 Liquor Laws <input type="checkbox"/> 640 R.R. & Truck <input type="checkbox"/> 650 Airline Regs. <input type="checkbox"/> 660 Occupational Safety/Health <input type="checkbox"/> 690 Other LABOR <input type="checkbox"/> 710 Fair Labor Standards Act <input type="checkbox"/> 720 Labor/Mgmt. Relations <input type="checkbox"/> 730 Labor/Mgmt. Reporting & Disclosure Act <input type="checkbox"/> 740 Railway Labor Act <input type="checkbox"/> 790 Other Labor Litigation <input type="checkbox"/> 791 Empl. Ret. Inc. Security Act IMMIGRATION <input type="checkbox"/> 462 Naturalization Application <input type="checkbox"/> 463 Habeas Corpus—Alien Detainee <input type="checkbox"/> 465 Other Immigration Actions	<input type="checkbox"/> 422 Appeal 28 USC 158 <input type="checkbox"/> 423 Withdrawal 28 USC 157 PROPERTY RIGHTS <input type="checkbox"/> 820 Copyrights <input checked="" type="checkbox"/> 830 Patent <input type="checkbox"/> 840 Trademark SOCIAL SECURITY <input type="checkbox"/> 861 HIA (1395ff) <input type="checkbox"/> 862 Black Lung (923) <input type="checkbox"/> 863 DIWC/DIWW (405(g)) <input type="checkbox"/> 864 SSID Title XVI <input type="checkbox"/> 865 RSI (405(g)) FEDERAL TAX SUITS <input type="checkbox"/> 870 Taxes (U.S. Plaintiff or Defendant) <input type="checkbox"/> 871 IRS—Third Party 26 USC 7609	<input type="checkbox"/> 400 State Reapportionment <input type="checkbox"/> 410 Antitrust <input type="checkbox"/> 430 Banks and Banking <input type="checkbox"/> 450 Commerce <input type="checkbox"/> 460 Deportation <input type="checkbox"/> 470 Racketeer Influenced and Corrupt Organizations <input type="checkbox"/> 480 Consumer Credit <input type="checkbox"/> 490 Cable/Sat TV <input type="checkbox"/> 810 Selective Service <input type="checkbox"/> 850 Securities/Commodities/Exchange <input type="checkbox"/> 875 Customer Challenge 12 USC 3410 <input type="checkbox"/> 890 Other Statutory Actions <input type="checkbox"/> 891 Agricultural Acts <input type="checkbox"/> 892 Economic Stabilization Act <input type="checkbox"/> 893 Environmental Matters <input type="checkbox"/> 894 Energy Allocation Act <input type="checkbox"/> 895 Freedom of Information Act <input type="checkbox"/> 900 Appeal of Fee Determination Under Equal Access to Justice <input type="checkbox"/> 950 Constitutionality of State Statutes
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V. ORIGIN

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- ☒ 1 Original Proceeding
☐ 2 Removed from State Court
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☐ 6 Multidistrict Litigation
☐ 7 Appeal to District Judge from Magistrate Judgment

VI. CAUSE OF ACTION

Cite the U.S. Civil Statute under which you are filing (Do not cite jurisdictional statutes unless diversity):

35 U.S.C. 271

Brief description of cause:

Patent Infringement

VII. REQUESTED IN COMPLAINT:

☐ CHECK IF THIS IS A CLASS ACTION UNDER F.R.C.P. 23
 DEMAND \$

CHECK YES only if demanded in complaint:
 JURY DEMAND: ☒ Yes ☐ No

VIII. RELATED CASE(S) IF ANY

(See instructions):

JUDGE

DOCKET NUMBER

DATE
 April 1, 2008
 SIGNATURE OF ATTORNEY OF RECORD
 IRIS SOCKEL MITRAKOS Iris S. Mitrakos

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SOUTHERN DISTRICT OF CALIFORNIA
SAN DIEGO DIVISION

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USAO #: 08CV0595
Judge.: JEFFREY T MILLER
Amount.:
Check#: BC12824 \$350.00 CK

Total-> \$350.00

FROM: PULSE ENGINEERING INC V.
MASCON INC